PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Assistant Commissioner for Patents
United States Patent and Trademark Office
Box PCT
Washington, D.C.20231
ÉTATS-UNIS D'AMÉRIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 04 November 1999 (04.11.99)	
International application No. PCT/CA99/00247	**Applicant's or agent's file reference** 96622-PCT
International filing date (day/month/year) 23 March 1999 (23.03.99)	**Priority date** (day/month/year) 24 March 1998 (24.03.98)
Applicant HAUGLI, Hans-Christian et al	

1. The designated Office is hereby notified of its election made:

[X] in the demand filed with the International Preliminary Examining Authority on:

08 October 1999 (08.10.99)

[ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was

[ ] was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO **34, chemin des Colombettes** **1211 Geneva 20, Switzerland**	Authorized officer Marc Salzman
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

Form PCT/IB/331 (July 1992)

2936111

PATENT COOPERATION TREATY

REC'D 29 JUN 2000
WIPO PCT

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
96622-PCT		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/CA99/00247	23/03/1999	24/03/1998

International Patent Classification (IPC) or national classification and IPC
H04B7/212

Applicant
VISTAR TELECOMMUNICATIONS INC. et al.

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 8 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☒ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
08/10/1999	27.06.2000

Name and mailing address of the international preliminary examining authority:
European Patent Office
D-80298 Munich
Tel. +49 89 2399 - 0 Tx: 523656 epmu d
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Authorized officer
Helms, J
Telephone No. +49 89 2399 2451

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/CA99/00247

I. Basis of the report

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

Description, pages:

5-14	as originally filed			
1-4,4a	as received on	17/04/2000	with letter of	13/04/2000

Claims, No.:

1-21	as received on	17/04/2000	with letter of	13/04/2000

Drawings, sheets:

1/5-5/5	as originally filed

2. The amendments have resulted in the cancellation of:

☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-21
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-16
	No:	Claims	17-21
Industrial applicability (IA)	Yes:	Claims	1-21
	No:	Claims	

2. Citations and explanations

see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Reference is made to the following documents:

   D1: EP-A-0 687 078 (NOKIA MOBILE PHONES LTD) 13 December 1995
   D2: US-A-4 726 040 (ACAMPORA ANTHONY) 16 February 1988

2. Independent **claims 1 and 10** are concerned with a packet data communication system having a control station and a plurality of remote terminals communicating over a wireless link.

   Document D1 which is considered to represent the closest prior art also discloses a system for transmitting packet data in a mobile radio network.
   D1 does not disclose that a carrier forming a control channel carrying control information pertaining to other packet data carriers is transmitted simultaneously with said packet data carriers to the remote terminals, where the control information extracted from the control channel is used to identify that said packet data is destined for said terminal.

   The skilled person working with a system as described by document D1 would like to reduce the delay of the system.

   This problem is solved by the above mentioned features of claims 1 and 10 by simultaneously transmitting the control channel together with the data channels by using different carriers.
   Since these features are neither disclosed by the prior art nor obvious to the skilled person, the subject-matter of independent **claims 1 and 10** can be acknowledged to involve an inventive step according to Art. 33(3) PCT.

3. **Claims 2-9 and 11-16** are dependent on claims 1 and 10, respectively, and as such also meet the requirements of the PCT with respect to novelty and inventive

step.

4. The present application does not meet the requirements of Art. 33(3) PCT, because the subject-matter of **claims 17-21** does not involve an inventive step.

4.1 Document D1 which is considered to represent the closest prior art discloses following features (applying the terminology of independent **claim 17**):

A mobile terminal (column 11, lines 33, 34) forming part of a packet data communication system having a control station and a plurality of remote terminals that communicate on demand with said control station over a wireless link,
said terminal comprising:
- a receiver for receiving an incoming signal (a receiver is an implicit feature of the disclosed mobile station);
- an analog-to-digital converter for digitizing said received signal (an analog-to-digital converter is an implicit feature of the disclosed mobile station, especially for the digital GSM standard, column 4, line 44);
characterized in that ...
- a processor continually monitors said ... signal to extract control information from said control channel (column 11, lines 45-47) and extracts packet data destined for said terminal from one or more of said data channels (column 11, lines 39-41) in response to control information received on said control channel identifying said packet data as destined for said terminal (column 13, lines 21-24).

Document D1 does not disclose a buffer storing said digitized received signal.

It is a matter of normal design procedure for the skilled person to store received data in a buffer in order to apply further processing on a sequence of this data (see e.g. document D2, column 5, lines 23-37 and document D1, column 10, lines 13-17). Therefore, the subject-matter of this claim cannot be acknowledged to involve an inventive step.

4.2 The features of **claims 18-20** are matters of normal design procedure for the

skilled person in order to implement a receiver and in order to save processing costs. Therefore, the subject-matter of these claims cannot be regarded to be inventive.

4.3 The feature of **claim 21** is disclosed by document D1 (column 11, lines 10-17). Therefore, the subject-matter of this claim cannot be acknowledged to be inventive.

Re Item VIII

Certain observations on the international application

1. **Claim 17** is not clear, because the expressions "said control channel" and "said data channel" are misleading. These expressions have not been introduced beforehand.

2. From the contents of the claims it was understood, that **claim 19** should refer to claim 17 instead of claim 15 and that **claim 20** should refer to claim 19 instead of claim 16.

3. The aspect of the invention described on pages 13 and 14 and shown in figure 9 does not fall within the scope of the claims. This inconsistency between the claims and the description leads to doubt concerning the matter for which protection is sought, thereby rendering the claims unclear (Article 6 PCT).

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	FOR FURTHER ACTION	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
96622-PCT		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/CA 99/ 00247	23/03/1999	24/03/1998

Applicant

VISTAR TELECOMMUNICATIONS INC. et al.

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

   a. With regard to the **language,** the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

   [ ] the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

   b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

   [ ] contained in the international application in written form.

   [ ] filed together with the international application in computer readable form.

   [ ] furnished subsequently to this Authority in written form.

   [ ] furnished subsequently to this Authority in computer readble form.

   [ ] the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   [ ] the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. [ ] **Certain claims were found unsearchable** (See Box I).

3. [ ] **Unity of invention is lacking** (see Box II).

4. With regard to the **title,**

   [ ] the text is approved as submitted by the applicant.

   [X] the text has been established by this Authority to read as follows:

   TDMA PACKET DATA COMMUNICATION SYSTEM

5. With regard to the **abstract,**

   [X] the text is approved as submitted by the applicant.

   [ ] the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No. 1

   [X] as suggested by the applicant.

   [ ] because the applicant failed to suggest a figure.

   [ ] because this figure better characterizes the invention.

   [ ] None of the figures.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/CA 99/00247

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04B7/212 H04B7/26

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0 687 078 A (NOKIA MOBILE PHONES LTD) 13 December 1995 see abstract see column 1, line 19 - line 49 see column 4, line 31 - column 5, line 3 see claims 1-9 ---	1-4,8, 10-13, 15,17, 19,20
Y	US 4 726 040 A (ACAMPORA ANTHONY) 16 February 1988 see abstract see column 2, line 67 - column 4, line 17 see claims 1-4; figure 1 --- -/--	1-4,8, 10-13, 15,17,19

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
8 June 1999	16/06/1999

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Lazaridis, P

1

Form PCT/ISA/210 (second sheet) (July 1992)

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0 802 677 A (HUGHES AIRCRAFT CO) 22 October 1997 see abstract see page 4, line 56 - page 5, line 13 see page 6, line 39 - line 52 see claims 1,4,5,10	20

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/CA 99/00247

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0687078 A	13-12-1995	FI 942702 A	09-12-1995
		CN 1115164 A	17-01-1996
		JP 7336774 A	22-12-1995
		US 5729541 A	17-03-1998
US 4726040 A	16-02-1988	CA 1256607 A	27-06-1989
EP 0802677 A	22-10-1997	JP 10051497 A	20-02-1998

TDMA PACKET DATA COMMUNICATION SYSTEM

This application claims the benefit under 35 USC 119(e) of prior United States provisional application number 60/079,134 filed March 24, 1998.

This invention relates to a packet data communication system suitable for transferring data between a large number of mobile terminals and a central control station. The system is particularly suited for a satellite based system, where the central control communicates with the terminals via an orbiting satellite, but it could be applied to ground based systems.

There are many situations where it is desirable to transfer data between a control station and a plurality of distributed mobile terminals. For example, in the trucking industry, the truck's on-board monitoring and logging devices may automatically report usage and location information back to a central station. Also, information relating to the environmental conditions, condition of the load, for example, or the temperature of refrigerated containers, can be reported. The operator may need to send schedule or routing changes to the drivers. Paging systems require text messages to be sent to individual customers. Traditionally these systems have carried relatively small amounts of data and do not require wideband channels. The bandwidth requirements, however, can change from time to time depending on the type and amount of data that needs to be transferred. Clearly, for example, voice channels will require a wider bandwidth channel than one that merely communicates position or environmental information.

Typically, SCPC (a Single Carrier per Channel) techniques are employed for such systems. In SCPC, as the name implies, each active channel is assigned a single narrow band carrier, typically not more than 20 KHz wide. The assigned channel depends on availability and desired bit rate. Bit rates are typically 0. 6, 4. 8, 19.2, kilobits per second. When the control station wishes to send a message to the terminal, the targeted terminal is notified over a very low bit rate control channel that it should expect to receive a message on a particular frequency. The targeted terminal then tunes to that frequency in order to receive and decode the incoming message.

In order to provide a sufficient number of channels, the maximum channel bit rate is typically limited to 19. 2 kilobits per second. This means that such systems are not

capable of carrying high quality voice signals, which typically require at least 32 kilobits per second. Such systems are generally not suitable for handling graphic information such as web pages, which is becoming an increasingly important application.

The need to assign a message channel over a control channel before passing the message also introduces a delay, known as latency, which makes it difficult to conduct interactive communications, for example, with the keyboard in real time.

An object of the invention is to provide a system that alleviates these disadvantages.

According to the present invention there is provided a packet data communication system having a control station and a plurality of remote terminals that communicate on demand with said control station over a wireless link, said control station comprising a data port for receiving data packets destined for said terminals; means for generating a plurality of data channels for carrying said data packets; means for assigning said data packets destined for a particular terminal to one or more of said data channels; means for generating a control channel carrying control information pertaining to said data channels; and means for transmitting said carriers to said mobile terminals as an r.f. signal; and each of said terminals comprising a receiver for receiving said r.f. signal; an analog-to-digital converter for digitizing said received signal; a buffer for storing said digitized received signal; means for monitoring said control channel to extract control information therefrom; and means for processing said stored signal to extract said packet data destined for said terminal from one or more of said data channels in response to control information received on said control channel.

Normally the received signal will be downconverted and demodulated to baseband prior to analog-to-digital conversion, although if desired with high speed processors it is contemplated that the entire processing could take place in the digital domain.

The remote terminals can either be fixed or mobile.

This system has the advantage of flexibility. Data packets can be sent on one channel or distributed simultaneously over several channels depending on the bandwidth requirements. For low bit rates, a single channel can be shared among several terminals. Unlike the prior art, it is not necessary for the channel assignment information to be sent

in advance of the message. The assignment information on the control channel and the message can be sent simultaneously since the raw incoming data is stored. Only minimal processing is required to extract assignment information unless the control channel indicates that a message is addressed to the terminal in question, in which case the message can be extracted from the assigned carrier(s).

The carriers are preferably generated in a digital signal processor (DSP), which carries out the channel assignments. The channels are then transmitted by means of the r.f. carrier, normally via satellite, to the destination terminals.

The aggregate channels on the r.f. carrier are transmitted as frames bounded by predetermined time instants. Each buffer typically stores one frame of information. Each frame can contain multiple packets distributed across multiple channels.

The control information informs a particular terminal that the current frame contains a message for that terminal, as well as the channel assignments, and time and frequency reference information. Only minimal processing is required at the terminals to monitor the control channel since this has a very narrow bandwidth, typically 600 b.p.s. No attempt is made to decode the data unless a message is received from the control channel that data is present for the terminal in question.

Each terminal also contains a DSP, which on receipt of a control message decodes the currently stored frame to extract data packets destined for that terminal. If the data contains wideband information, such as graphics, the packets are likely to be distributed sequentially over several channels. The DSP will extract the packets from the various channels in accordance with the information received on the control channel and arrange them in the appropriate order before outputting them to the data processing circuitry.

The signal processing is preferably carried out with an advanced DSP, such as the TMS320C60.

The system is thus capable of generating and demodulating simultaneous multiple carriers within the sampling bandwidth. Per frame adaptive processing of multiple carriers is achieved through buffered data and sequential processing.

The system can support multiple bit rates and power levels. It can also support multiple return access methods, such as unslotted ALOHA, slotted ALOHA and assigned

channel. It can be used for mobile dispatch services employed text and canned messages, medium length messages with low latency, as well as for TCP/IP connections which provide LAN extension, FT protocol, email and database transactions.

The invention also provides a method of establishing communication between a control station and one or more of a plurality of mobile terminals over a wireless link, comprising the steps of generating a plurality of carriers; dynamically assigning one or more data carriers to a destination terminal; modulating said one or more carriers with packet data for said destination terminal; generating a control carrier containing information pertaining to said modulated carriers; transmitting said data carriers and said control carrier as an aggregate signal to said destination terminal; buffering said aggregate signal at said destination terminal; extracting said control information from said aggregate signal; and extracting data from said buffered signal in response to a received assignment in said control information.

The invention also provides a system for improving data throughput by utilizing a bandwidth manager. The bandwidth manager monitors network parameters and compares current parameters with statistical data stored in a database. Heuristic rules are used to decide what changes need to be made to the parameters to optimize throughput.

The invention will now be described in more detail, by way of example only, with reference to the accompanying drawings, in which:-

Figure 1 is a block diagram of a multiple rate satellite packet data system;

Figure 2 shows the forward link spectrum;

Figure 3 is a block diagram of a part of a satellite ground station;

Figure 4 illustrates a frame on the forward link;

Figure 5 is a block diagram of a remote terminal;

Figure 6 is a more detailed diagram of a remote terminal;

Figures 7a shows a prior art protocol and Figure 7b shows a protocol with simultaneous transmission of data;

Figure 8 shows the spectral distribution of the return link; and

5. A packet data communication system as claimed in claim 1, wherein each said terminal further comprises a demodulator for demodulating said received r.f. signal prior to analog-to-digital conversion.

6. A packet data communication system as claimed in claim 5, wherein said demodulator is a quadrature demodulator.

7. A packet data communication system as claimed in claim 4, wherein said digital signal processor also provides said processing means, said digital signal processor extracting data from carriers identified by said control signal.

8. A packet data communication system as defined in claim 1, where said means for assigning data packets includes means to dynamically assign said data packets to one or more channel types.

9. A packet data communication system as defined in claim 8 wherein said channel types include: random access channels; assigned TDM channels; assigned TDMA channels; and dedicated channels.

10. A method of establishing communication between a control station and one or more of a plurality of mobile terminals over a wireless link, comprising the steps of:

generating a plurality of carriers;

dynamically assigning one or more data carriers to a destination terminal;

modulating said one or more carriers with packet data for said destination terminal;

generating a control carrier containing information pertaining to said modulated carriers;

transmitting said data carriers and said control carrier as an aggregate signal to said destination terminal;

buffering said aggregate signal at said destination terminal;

extracting said control information from said aggregate signal;

and extracting data from said buffered signal in response to a received assignment in said control information.

11. A method as claimed in claim 10, wherein said aggregate signal is transmitted as a framed signal, each frame containing one or more of said carriers and said control signal.

12. A method as claimed in claim 11, wherein said aggregate signal is stored in said buffer one frame at a time, and said control information is extracted from said stored frame to determined whether it contains data intended for the destination terminal.

13. A method as claimed in claim 10 wherein said aggregate signal comprises a baseband signal that is modulated onto an r.f. carrier.

14. A method as claimed in claim 13, wherein said r.f. carrier is first demodulated at said terminals to extract said baseband signal, and said baseband signal is then passed through an analog-to-digital converter prior to being buffered in said terminal.

15. A mobile terminal for receiving date from a packet data communication system having a control station and a plurality of remote terminals that communicate on demand with said control station over a wireless link, said terminal comprising:

a receiver for receiving an incoming signal;

an analog-to-digital converter for digitizing said received signal;

a buffer for storing said digitized received signal;

means for monitoring said control channel to extract control information therefrom; and

means for processing said stored signal to extract packet data destined for said terminal from one or more of said data channels in response to control information received on said control channel.

16. A mobile terminal as claimed in claim 15, further comprising a demodulator for demodulating said incoming signal to baseband before said incoming signal is passed to said analog-to-digital converter.

17. A mobile terminal as claimed in claim 15, wherein said means for monitoring and said means for processing are implemented in a digital signal processor.

18. A mobile terminal as claimed in claim 16, wherein said means for monitoring and said means for processing are implemented in a digital signal processor.

19. A mobile terminal as claimed in claim 15 including means to dynamically assign data packets to various channel types for communicating with said control station.

20 A bandwidth management system for improving data throughput of a packet data communication network comprising:

means for receiving current network performance information;

storage means for storing statistical information respecting said network; and

means for comparing said current and statistical information and for adjusting network parameters based on said comparison in order to improve data throughput.

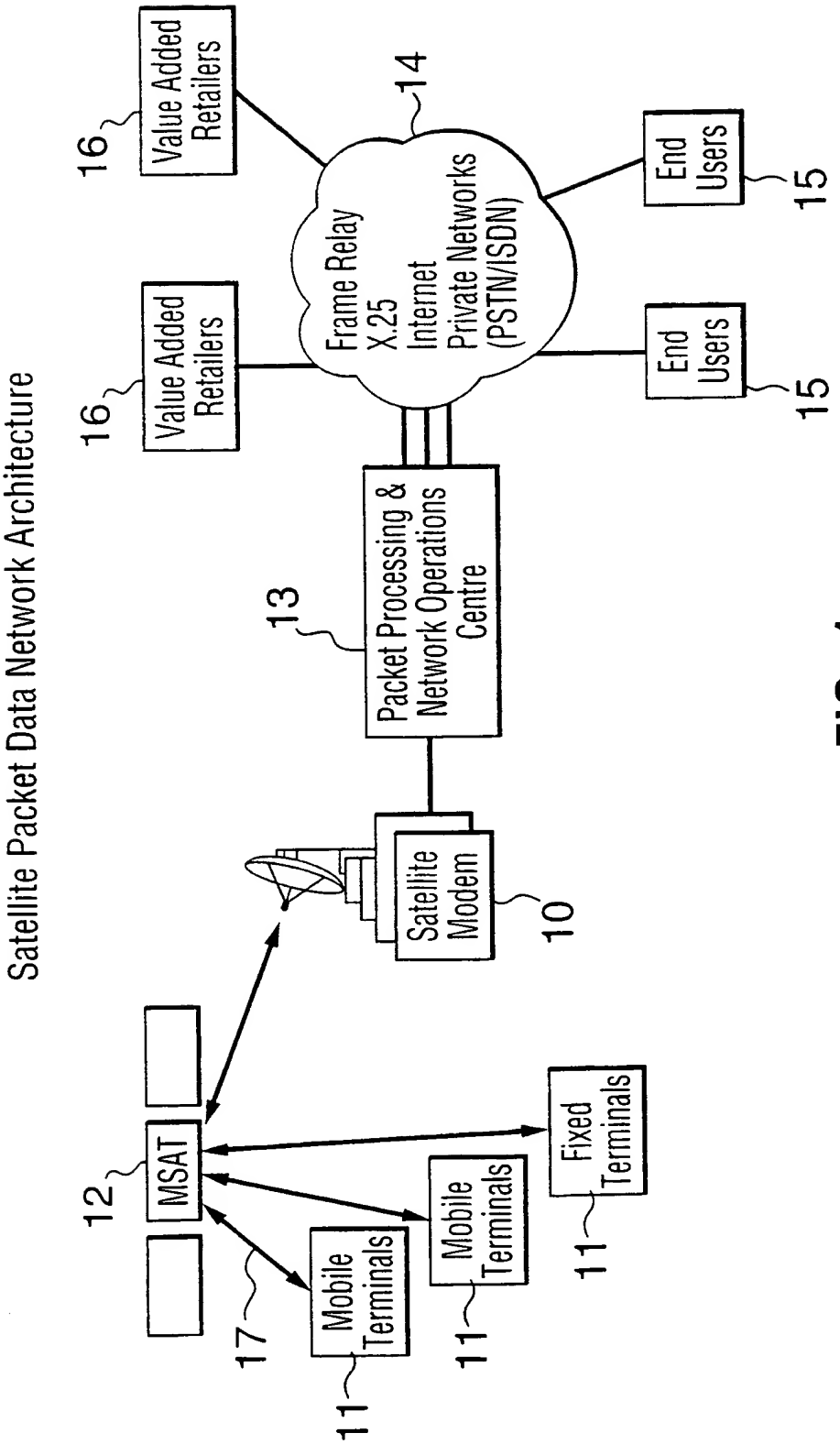

FIG. 1

SUBSTITUTE SHEET (RULE 26)

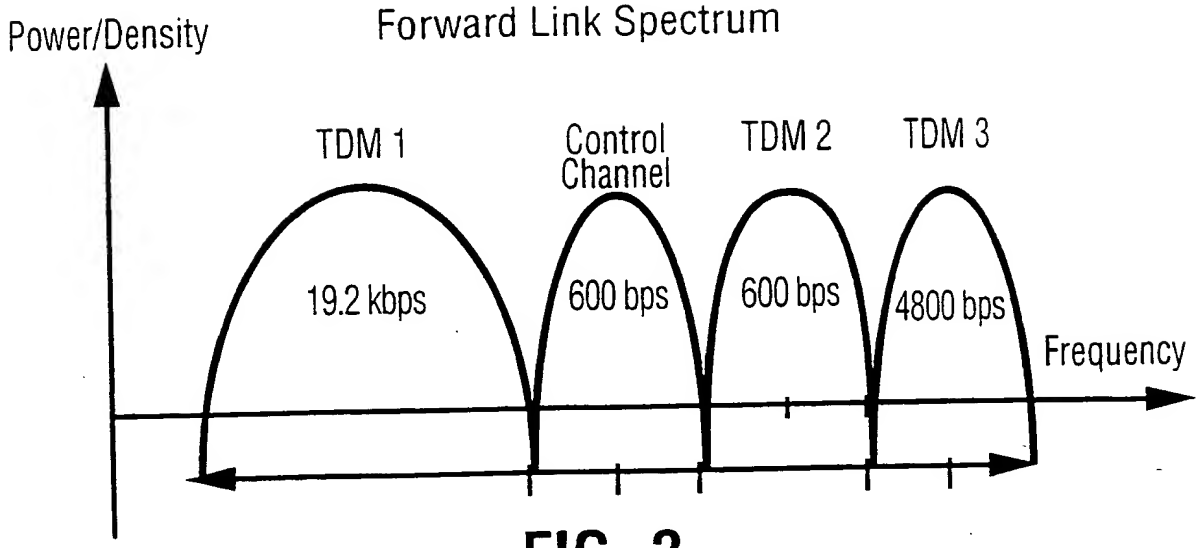
Power/Density
Forward Link Spectrum
TDM 1
Control Channel
TDM 2
TDM 3
19.2 kbps
600 bps
600 bps
4800 bps
Frequency

FIG. 2

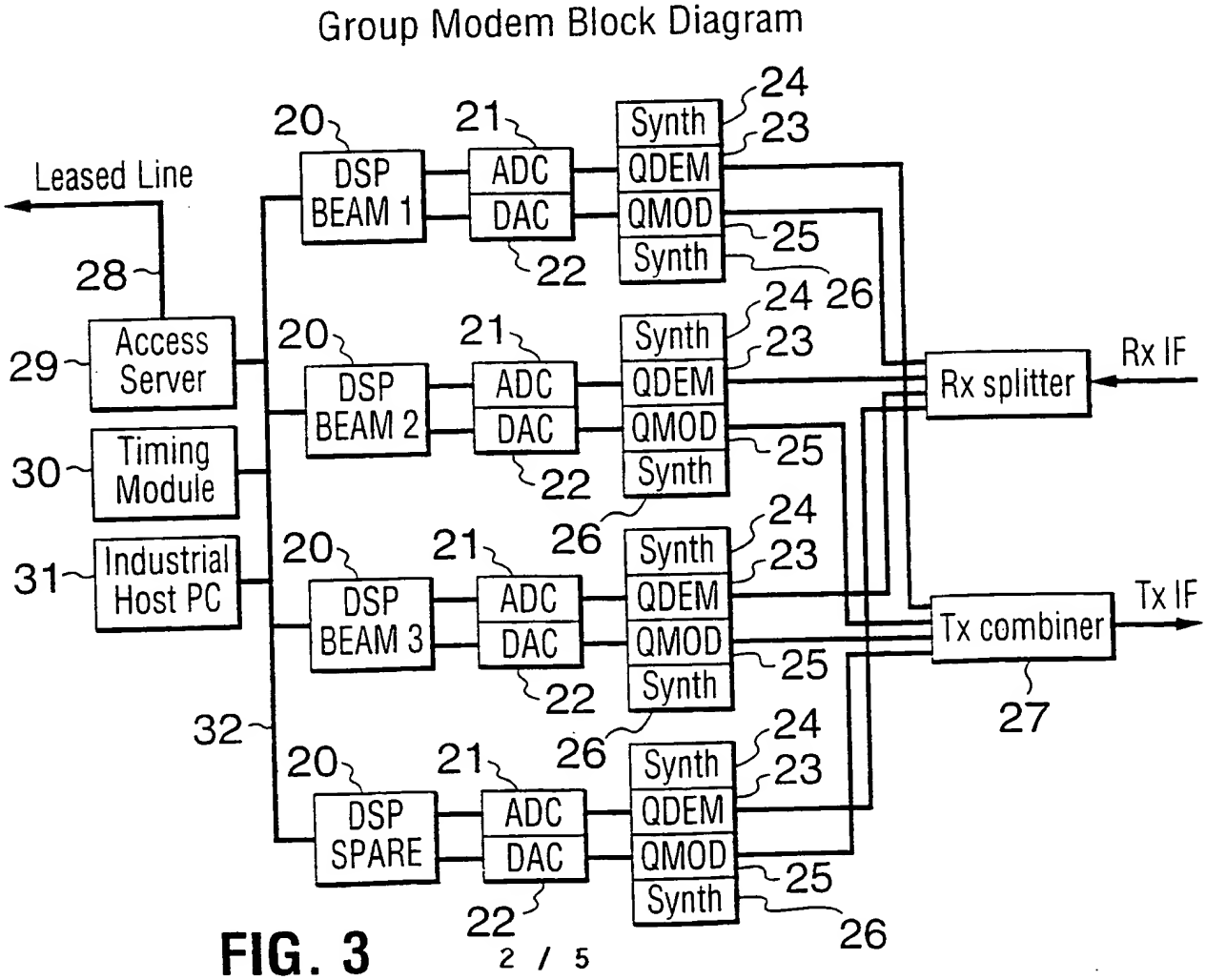
Group Modem Block Diagram
Leased Line
28
Access Server
29
Timing Module
30
Industrial Host PC
31
32
DSP BEAM 1
DSP BEAM 2
DSP BEAM 3
DSP SPARE
ADC
DAC
Synth
QDEM
QMOD
20
21
22
23
24
25
26
Rx splitter
Rx IF
Tx combiner
Tx IF
27

FIG. 3

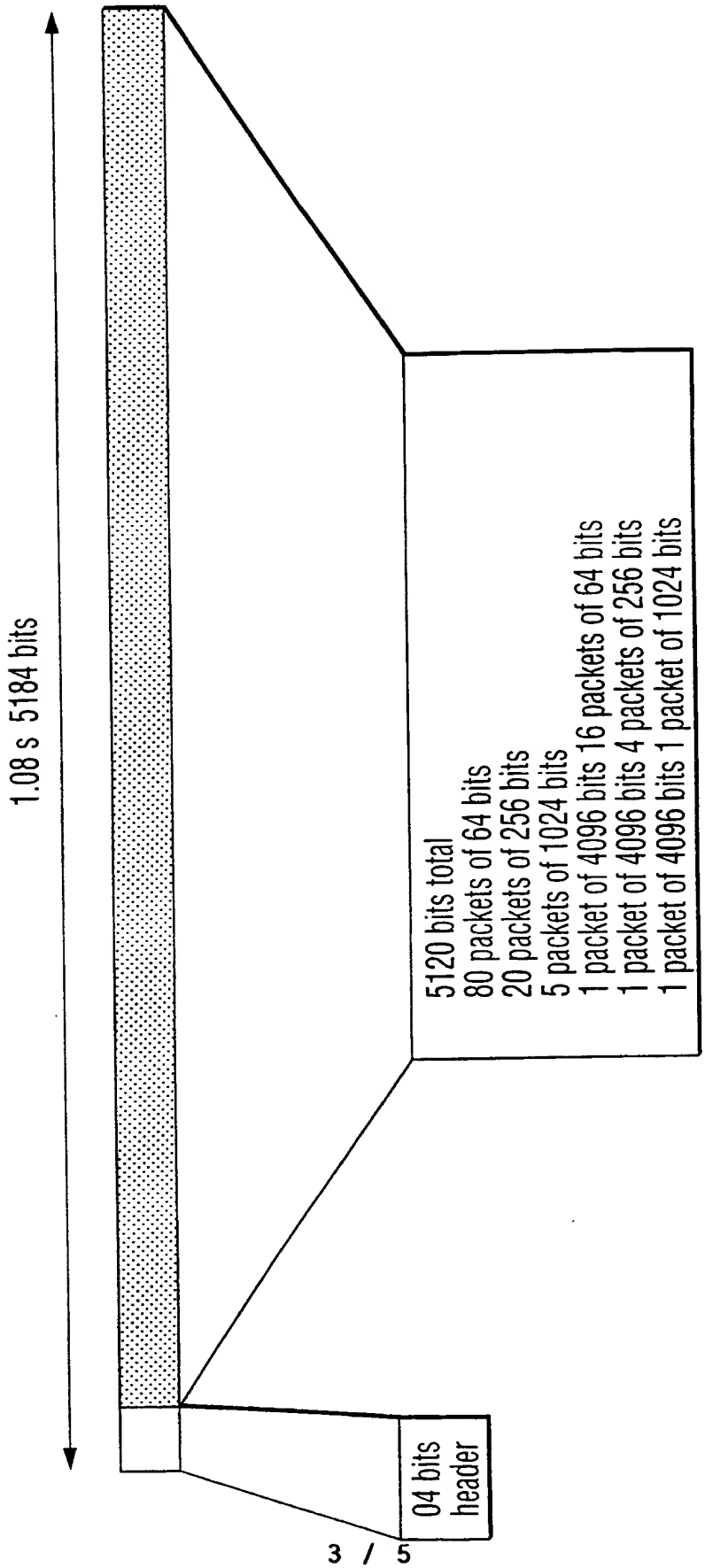
1.08 s 5184 bits
5120 bits total
80 packets of 64 bits
20 packets of 256 bits
5 packets of 1024 bits
1 packet of 4096 bits 16 packets of 64 bits
1 packet of 4096 bits 4 packets of 256 bits
1 packet of 4096 bits 1 packet of 1024 bits
04 bits
header

FIG. 4

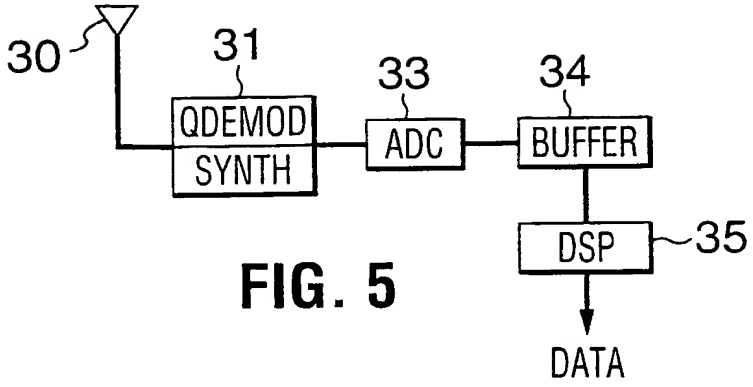

FIG. 5

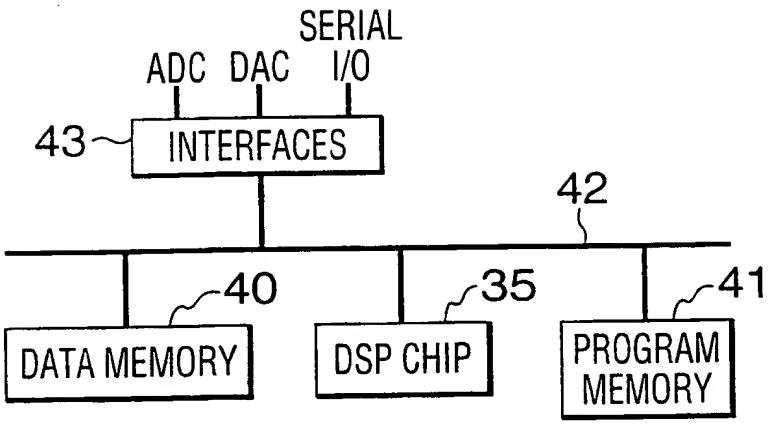

FIG. 6

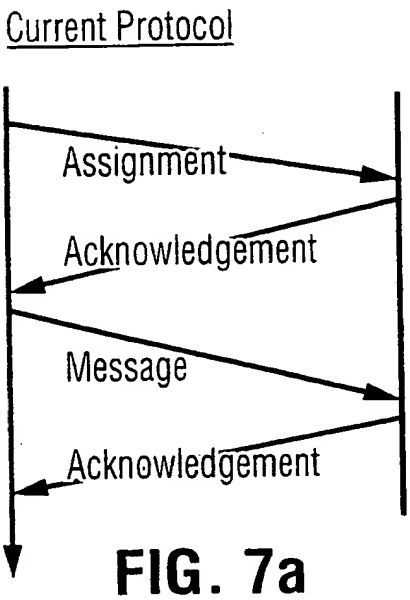

FIG. 7a

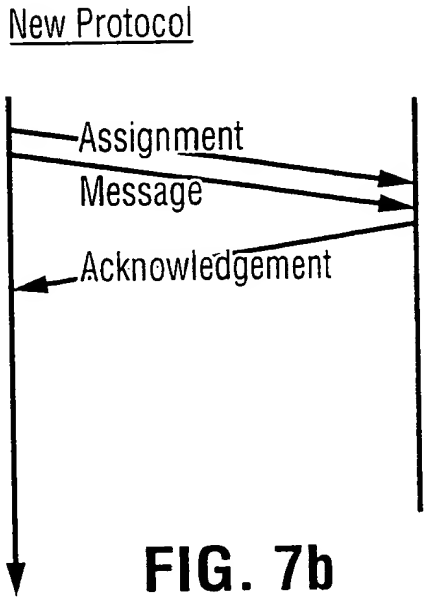

FIG. 7b

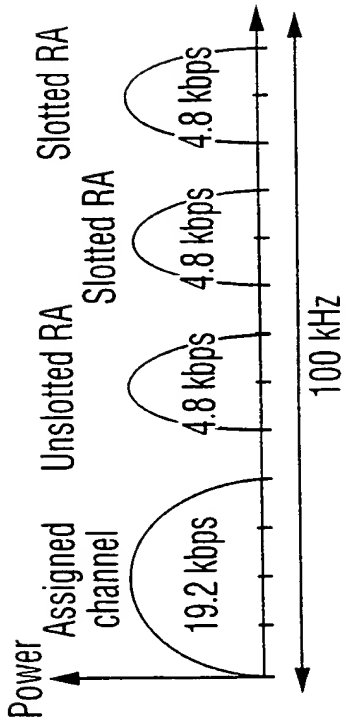
Power
Assigned channel
19.2 kbps
Unslotted RA
4.8 kbps
Slotted RA
4.8 kbps
Slotted RA
4.8 kbps
100 kHz

FIG. 8

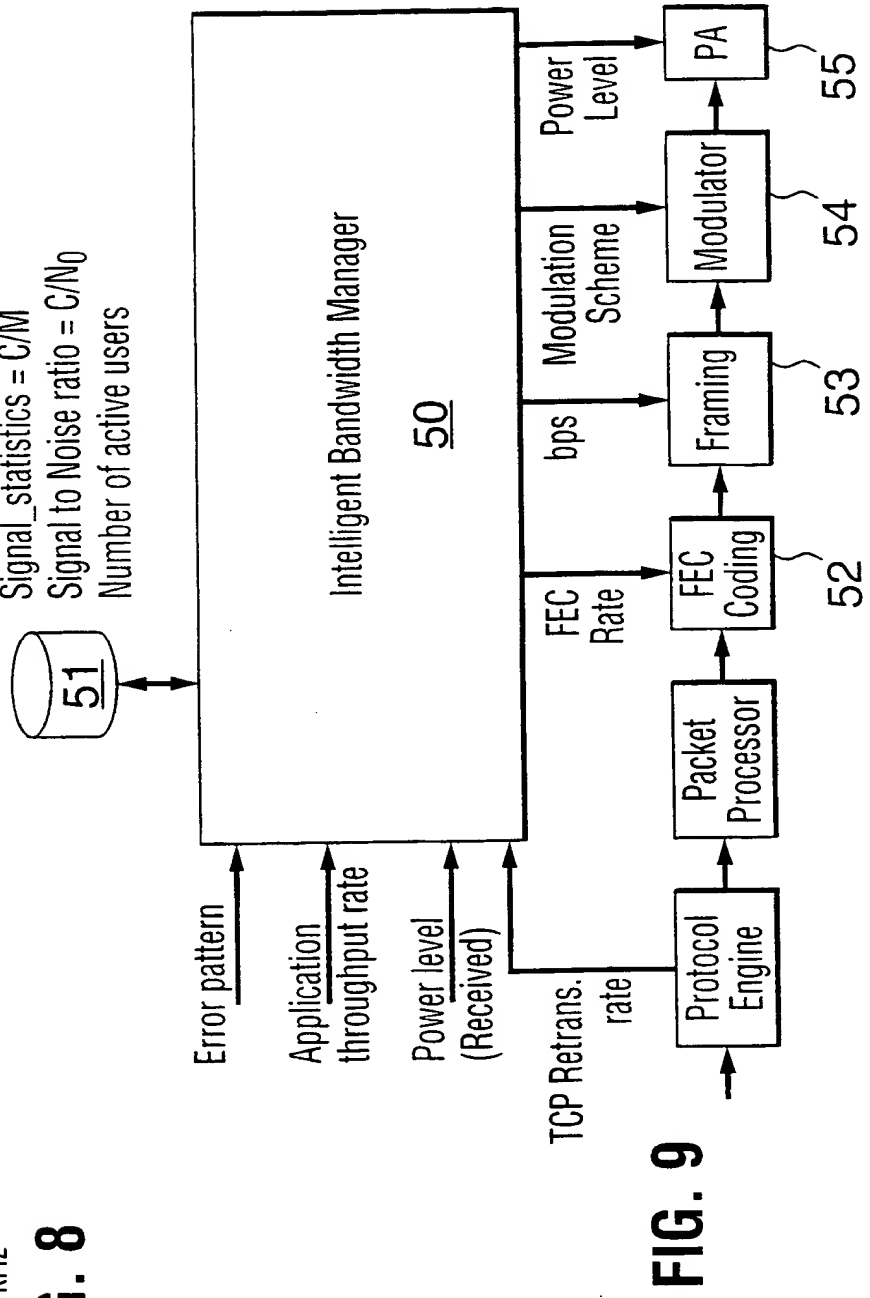
Signal_statistics = C/M
Signal to Noise ratio = C/N0
Number of active users
51
Intelligent Bandwidth Manager
50
Error pattern
Application throughput rate
Power level (Received)
TCP Retrans. rate
Protocol Engine
Packet Processor
FEC Rate
FEC Coding
52
bps
Framing
53
Modulation Scheme
Modulator
54
Power Level
PA
55

FIG. 9

INTERNATIONAL SEARCH REPORT

International Application No
PCT/CA 99/00247

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04B7/212 H04B7/26

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0 687 078 A (NOKIA MOBILE PHONES LTD) 13 December 1995 see abstract see column 1, line 19 - line 49 see column 4, line 31 - column 5, line 3 see claims 1-9 ---	1-4,8, 10-13, 15,17, 19,20
Y	US 4 726 040 A (ACAMPORA ANTHONY) 16 February 1988 see abstract see column 2, line 67 - column 4, line 17 see claims 1-4; figure 1 --- -/--	1-4,8, 10-13, 15,17,19

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
8 June 1999	16/06/1999

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Lazaridis, P

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/CA 99/00247

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0 802 677 A (HUGHES AIRCRAFT CO) 22 October 1997 see abstract see page 4, line 56 - page 5, line 13 see page 6, line 39 - line 52 see claims 1,4,5,10	20

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INTERNATIONAL SEARCH REPORT

...ormation on patent family members

Inter...nal Application No
PCT/CA 99/00247

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EP 0802677 A	22-10-1997	JP 10051497 A	20-02-1998